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EDITORIAL.

IT is a remarkable thing how slowly advances in the practice of anæsthetics which originate in one country are adopted in others. The United States, Canada, and Great Britain may claim to be honourable denials of this statement, but it certainly holds good to a remarkable degree of the Continental countries. The facts so far as France is concerned may be read in the interesting article from Dr. G. Flexer which we print on another page. There the reader will learn that only recently and still only to a slight extent is the use of nitrous oxide and oxygen being practised in France. The same thing is true of Germany, and to a more marked degree of Italy. The skilled use of ether from closed inhalers provided an even more remarkable example of the belated learning to which we have referred. It was an astonishing experience to read the enthusiastic reports of Continental anæsthetists on the results of administering ether from the Ombredanne and similar inhalers. Their accounts might justifiably have been written only by persons unacquainted with the work of Clover fifty years earlier, who had never read of, still less employed, his portable regulating inhaler. This instrument, the prototype of all closed ether inhalers, remains at once the most ingenious and most effective of them. It appears to remain almost completely unknown to our Continental confreres who have busily invented similar but less admirable instruments at the time when English-speaking anæsthetists are beginning to relegate closed ether to the things of the past. Often the English are accused of being insular in outlook as well as geographically. In the matter of anæsthesia the accusation can much more truthfully be levelled at our colleagues across the Channel, except so far as their geographical situation is concerned.

A STUDY OF FRENCH METHODS OF ANÆSTHESIA.

(Made under the direction of Dr. Desmarest, Chief Surgeon at the Ambroise-Paré Hospital, Paris.)

By Madame Flexer-Lawton,

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Writing in 1844, Velpeau asserted that efforts to avoid pain in operations were chimeric and useless. Three years later, in 1847, the same Velpeau, speaking at the Paris Academy of Sciences, acknowledged that the discovery of anæsthesia was one of the most important events that had occurred in the world's history, and that the results to be obtained were incalculable.

Before Lister's experiments and those of Pasteur, this discovery conferred on surgery possibilities that were immense. The methods that have been employed since 1844 right down to the present day have continued to vary. For about the first forty years of this period, anæsthesia by means of inhalation was the only method in favour.

Until 1880, or thereabouts, there was no local or regional anæsthesia induced by means of an alkaloid. Then, the experiments of MacLagan made known cocaine, whose toxic properties were found to be too great for its use to become general.

Among regional methods of anæsthesia the one which most rapidly predominated was that induced in the spine. Experimented on by Corning in 1885, and by Bier in 1899, it was popularized in France by Tuffier. Lumbar anæsthesia, on account of its procuring complete muscular relaxation in the abdomen, facilitated operations not only on the lower parts of the body and the perineum but also those more peculiarly gynæcological. Cathelin endeavoured to limit the application of this regional anæsthesia by perfecting his sacral method. Jonnesco enlarged the scope by carrying his anæsthesia into the sub-arachnoid spaces of the dorsal region.

Beginning in 1900, we have a period during which two rival methods are in conflict. 1. The old method of anæsthesia induced by inhalation. 2. The new method of anæsthesia by injection, leaving the upper nerve centres intact and endeavouring to block sensibility over an extensive area.

We are now in 1933. For some years, in Anglo-Saxon countries, fresh methods have been developing as the result of exceedingly interesting chemical researches. Surgeons are realizing the all-embracing importance of the anæsthetic act. So it seems a good time to try to make out an abridged anæsthetic balance-sheet as regards French surgery. For this, we had to obtain from a considerable number of surgeons a statement concerning their preferences and their daily method of anæsthesia. The despatch of over 100 letters brought us eighty replies, and it is from the information they supplied that we have drawn up this report.

We can still say that, in France, there are only two methods of anæsthesia largely employed, the one by inhalation, the other by injections. We purposely reserve rectal anæsthesia for a special mention.

Are there yet remaining partisans of chloroform? If so, they are relatively few. It is not necessary here to repeat the physiological and biological arguments that have gradually dethroned chloroform from the position of eminence it once occupied. When at last, tired of seeing the re-occurrence of fatal accidents, most of which were kept secret, surgeons wisely decided to have the toxicity of chloroform studied, it received its death-blow.

Everything has been said about the dangers of chloroform. One would think that it could no longer count on a single adherent. Yet it still has defenders. Professor Hartmann has never given it up; and we might quote the names of other surgeons.

Vanverts of Lille writes to us: " I employ chloroform pretty often, especially in cases of pregnant women." And Professor Potel of Lille says: " For nearly thirty-five years I used chloroform, first by the drop method, afterwards with Ricard's apparatus. Out of thousands of cases I had only one that terminated fatally; and this during the extirpation of a prelaryngeal tumour." Notwithstanding, Dr. Potel abandoned chloroform some six years ago. But Roussel of Reims remains faithful to it, asserting that chloroform given by his usual anæsthetist has never caused any serious accident. Sikora

of Tulle also uses chloroform, and, out of thousands of cases, has had only one death, that of a child he was operating upon for paraphimosis. Stuffed with bread and cake just before coming to the operation, the child vomited and died of syncope brought on by the entrance of food into the trachea.

These attestations show that the old chloroform method is not yet entirely a thing of the past, even though its dangers are so well known and acknowledged. A few days since, while we were preparing these notes, a professor at the Algiers Faculty of Medicine, Monsieur Tournade, discussed before the Paris Surgical Society this question: "Is it allowable to treat chloroform syncopes by intraventricular injections of adrenaline?"

Ether, to which the school of Lyons was and is attached, has not supplanted chloroform without great difficulty. Julliard's mask, which obliged ether to be administered in massive doses, was for a long time a drawback to success. Dr. Desmarest remembers that it was a certain foreign surgeon who explained to him the technique of etherization obtained by the drop method with the help of a small mask. Such means were no longer employed from the time when Ombredanne produced his apparatus, similar to that of Clover, which marked etherization's great period.

Convinced partisans of ether are not so numerous as we had calculated; and the decrease in their number can be attributed only to post-operative complications, especially pulmonary, which the use of ether frequently entails, and which also frequently are the cause of the patient's death.

Nevertheless, ether, in France, to a considerable extent, holds its own, no doubt because its administration seems at first sight to require no particular knowledge. In too many surgical operations, the Ombredanne apparatus is entrusted to young students walking the hospital or to those learning how to anæsthetize; and, provided that the patient sleeps soundly, the surgeon goes on with his own business without, in the least, troubling as to what quantity of ether the patient is absorbing.

It is ether's easy administration which has been its success. The hypersecretion of mucus that accumulates in the pharynx and interferes with respiration may cause temporary asphyxia without there being any immediate danger of death. Pulmonary complications,

when they occur, do so only a day or two after the operation. So nobody needs to think about them.

Out of the aggregate of those who replied to our inquiry, forty-two surgeons use ether only, while others, more eclectic, keep it for certain operations.

Dr. Capette has recourse almost exclusively to ether. Dr. Mouchet prefers ether, and reserves Schleich's mixture for patients liable to pulmonary complications.

Among those struck by the danger to which the respiratory system is exposed during the administration of the ether vapour, there were some who tried to find a remedy. We may mention the name of Dr. Descarpentries of Roubaix, who uses warm ether vapour with a contrivance of his own invention. Descarpentries writes to us that out of the many thousands of anæsthesias he has given, excellent results were obtained, without accidents, without vomiting, and without lung complications. Other surgeons have tried to cure or avoid such complications by giving creosote enemas. The various anæsthetic mixtures that have in recent years been experimented with and adopted, some with a promise of permanence, are all preferable to the risk of employing chloroform or ether alone. The mixture most used in France is the one known as Schleich's, a combination of chloroform and ether with chloride of ethyl. In the replies to our letters, we have picked out forty-two names of surgeons advocating the use of this mixture.

Professor J. L. Faure writes to us: "I have used it almost exclusively for twenty-six years. I give it the preference over every other anæsthetic. I have never had a serious accident with it, although, at the hospital, our anæsthesias are entrusted to students often without much experience. The results are good. We have neither the accidents common in the use of chloroform, nor the bronchial irritation due to ether. Post-anæsthetic vomiting is, in general, of little significance. I have never had lung accidents that could be indubitably attributed to the mixture; indeed, I am of opinion that, in this respect, anæsthetics, of whatever kind, are accused on insufficient grounds. So Schleich's mixture for me. I shall die without changing my mind."

Dr. Hertz of Paris uses 60 per cent of Schleich's mixture, while Dr. Louis Michon, also of Paris, sees no advantage in adding the gomenol which led to the production of Balsoform. This last men-

tioned mixture has also its partisans. As regards anæsthesias procured by means of ethyl chloride, we may remark that the surgeons who tell us they use it limit its employment to minor surgery.

In summing up the results of our inquiry, we see first that many surgeons, even when using anæsthetics only by inhalation, show eclecticism, a practice which allows us to understand why the numbers quoted in order to establish the different preferences of the French school appear much larger than the number of replies made. Often, in fact, a surgeon will have recourse at one time to ether, at another time to ethyl chloride or else to Schleich's mixture. Remembering this, we find:

42 partisans of ether;
42 partisans of Scheich's mixture;
11 partisans of chloroform;

and we may add that some surgeons use chloroform only for young children and in small doses. We ourselves have seen Dr. Desmarest make use of this anæsthetic for very young children in preference to ether, especially if such children were suffering from pathological changes in the respiratory organs. We find ten partisans of ethyl chloride in cases of minor surgery and also for beginning a narcosis. Professor Etienne of Montpellier, by a method of his own, uses it alone for procuring general anæsthesia, and finds its results satisfactory, but prefers not to have recourse to it in abdominal cases.

Regional anæsthesia, in which is comprised the spinal method, was introduced as a competitor of anæsthesia by inhalation. Dr. Desmarest remembers with what enthusiasm as a student he saw Tuffier take a cyst from the ovary of a patient under spinal anæsthesia. Since the year 1899, after a period of much resistance and of perhaps excessive enthusiasm, this method has established itself definitely in surgical practice. It has had its failures; but gradually the technique required for its success has been improved.

About three years ago, Professor Forgue of Montpellier and Dr. Basset, a Paris official hospital surgeon, published two substantial reports that throw exact light on this question. One needs only to read what is said in them and the discussions they called forth at two meetings of the French Surgical Association to learn what is the position taken up by French surgeons concerning spinal anæsthesia.

Here again the replies to our inquiry added to the discussions above mentioned authorize us to divide into two classes the partisans of

spinal anæsthesia. The first comprises those who recognize as superior no other method, and practise it exclusively in all sub-diaphragmatic operations. The second is that of the eclectics, who adopt this method in the majority of cases yet do not exclude anæsthesia by inhalation. The anæsthetic mostly favoured at present by both classes is Percain, although its efficacy is disputed. Professor Meriel of Toulouse is one of its warm advocates. Recently, at the International Surgery Congress, he expressed an opinion absolutely in its favour. Professor Forgue's opinions on the same subject may be summed up in this extract from his reply to our letter: " I put the brake on sharply at the Surgical Congress in speaking of the application of Spinal-anæsthesia, but acknowledged none the less its excellence when limited by a number of prudent rules that I endeavoured to lay down."

Professors Lenormand and Mocquot of Paris use spinal anæsthesia for the whole of gynæcological and rectal surgery, and in most surgical operations on the lower parts of the body—reduction of fractures, osteo-syntheses, resections, etc.

Professor Morin of Paris, genito-urinary surgeon, makes a large use of spinal anæsthesia with Allocaine in operations affecting the kidneys. For the urethra and the bladder he often employs epidural injections of scurocaine, to which Professor Mocquot has recourse in similar circumstances.

Dr. Labey of Paris also uses scurocaine for spinal anæsthesia, which he prefers for sub-umbilical operations and even in those on the stomach and liver.

Dr. Desplas of Paris, when performing serious operations on the sub-umbilical region and lower parts of the body, tempers his employment of the spinal method by ephedrine and its associates. His experience is based on 7000 cases.

Dr. Gouverneur of Paris reserves this anæsthesia for operations on the rectum, the prostate, the bladder and the perineum. He considers percaine to be dangerous.

Dr. Le Filliatre of Paris has been for twenty-seven years an ardent advocate of spinal anæsthesia, replacing, a year ago, cocaine by delcaine. " With this new product," he writes, " the surgeon finds post-operative morbidity and mortality in serious operations on the ab-

domen and urinary passages to be a negligible element, which is why I remain a faithful supporter of this method."

To these replies from the Capital, we will add a few from the provinces.

Professor Estor of Montpellier writes that, in sub-umbilical operations, he more frequently has recourse to spinal anæsthesia unless it is contra indicated by hypotension.

Professor Begouin of Bordeaux, an eclectic, procures his spinal anæsthesia by means of small doses (six centigrams) of syncaine when he operates on the lower parts of the body, and larger doses (eight centigrams) of syncaine in abdominal operations requiring complete muscular relaxation.

Dr. Chalier turns willingly to the spinal method for sub-umbilical surgery, and more systematically for important gynæcological cases affecting the colon, the pelvis, and the rectum.

Dr. Cotte of Lyons prefers the spinal method for the whole of abdominal surgery and for that concerning the lower parts of the body. Giving powdered novocaine in doses varying from ten to fifteen grammes, which he dissolves in the cerebro-spinal fluid, each time he uses it, he has never had, during the nine years of its injection, either inconvenience or accident.

Dr. Ducuing of Toulouse has recourse to spinal anæsthesia whenever operating on organs of the abdominal cavity except the stomach and the gall bladder. If the operation is a delicate or a difficult one, e.g., carcinoma of the colon, or salpingitis, it is best to procure spinal anæsthesia with 8 per cent syncaine, varying the dose according to the height and the place of the operation.

From the whole of France come expressions of opinion that are very similar; from Limoges, where Filhoulaud nearly always injects the spine with a 4 per cent solution of scurocaine when operating on the lower abdomen or on women, exception being made for cases where there is low blood pressure; from Cannes, where Dr. Fresson, who formerly at Shanghai used nothing but spinal anæsthesia to operate on the natives, keeps this method for 25 per cent of his cases; from Lyons, where Dr. Goullioud reserves it for long operations that entail shock, procuring his anæsthesia with 8 per cent stovaine; from Béziers, where Guibal, in operations on the stomach and liver, in the Wertheim operation, and that for extirpating a carcinoma of the rectum, makes a spinal injection with

4- per cent. novocain or with percaine; from Bordeaux, where Dr. Guyot uses spinal anæsthesia only for operations on the perineum, the vulva, the anus and the lower limbs. All show us the same trend of thought, exemplified further in the practice of Professor Jeanbrau of Montpellier, specialist for the urinary passages, who, injecting the spine with 8 per cent syncaine or scurocaine, performs all his operations on the bladder, the prostate, the urethra, even those that are prolonged, with entire satisfaction. And Professor Lapeyre writes to us from Montpellier: "Spinal anæsthesia has no rival in cases of difficult hysterectomy, in operations on the rectum, the anus, the perineum."

Side by side with these full approvals, we find opinions exhibiting reserve and doubt. Dr. George Leclerc of Dijon writes to us: "I have gone pretty deeply into the subject of spinal anæsthesia, and I have come to the conclusion that it is a method that has its dangers; and, though I often have recourse to it, I do so only on precise indications." René Le Fort of Lille says that he does not like to inject into the spine an anæsthetic that he could not get rid of if an accident should happen. Pouliquen of Brest, who employs the spinal method when operating on the perineum and in gynæcological cases, confesses that good results are far from being constant, and adds that he prefers novocain, which percaine has not yet supplanted.

Local anæsthesia and regional anæsthesia have also their ardent defenders. Without speaking of the minor operations that constitute the domain of the former, we must note the tendency of certain surgeons to use local analgesic in gastric operations. Following in the wake of Victor Pauchet, we see young surgeons, like d'Allaines, like Métivet, like Lanos, etc., advocate local anæsthesia through fear of the pulmonary complications that are so frequent in gastric surgery. Dr. Lanos is right to recapitulate so clearly in his reply to our inquiry the opinions he has formed. "The inconveniences of local anæsthesia," he says, "are felt by the surgeon, since it requires more time, more patience, greater deliberation and more gentleness in his movements. The advantages are reaped by his patient; they are evident, so it is not necessary to insist on them, except on the complete avoidance of operative shock." However, we must remark that regional anæsthesia, indications for which Dr. Pauchet had extended in particular to operations on the liver, seems to have been more and more abandoned.

We have reserved for separate mention some special ways of anæsthetizing, the introduction of which into France has been and is still being attempted:

1. By the rectum: Ether, and also avertin as an adjuvant.
2. By the mouth: Soneryl.
3. By the veins: Numal, somnifene, alcohol.
4. By inhalation: Nitrous oxide, acétylene, ethylene.

Ether anæsthesia by the rectum is in favour at present with a certain number of surgeons, who keep it for operations on the neck and face when the use of the mask is impossible. Few Paris and provincial surgeons alluded to it in their letters. However, Professor Bégouin, of Bordeaux, advocates it for operations on the head and neck that cannot be undertaken with a local anæsthetic alone.

Dr. Chalier, of Lyons, avows his preference for the colonic method of administration of ether for operations on the head, face and brain, for thoracoplasty in cases of tuberculosis and for the *Albee* operation in Pott's disease.

Dr. Leriche employs the oil-ether method for operations on the Gasserian Ganglion and in other surgical cases of brain lesion.

Intraenous injection, tried in France either with alcohol or with somnifene, is no longer practised. In the replies to our letters no mention is made of it, and there is little or no doubt that the accidents resulting from the use of it were the reason for its being given up by all surgeons.

In 1914, Dr. Fredet, of Paris, made known his experiments with intravenous injections of numal. Dr. Fredet is convinced of the excellence of numal if not as a total anæsthetic, at least as an adjuvant anæsthetic to begin with. In France Mr. Coudray, of Nogent le Rotrou, has added 159 observations to the 518 made personally by Dr. Fredet.

Anæsthetizing by inhalation with nitrous oxide, which is the best way physiologically, was not employed to any extent until lately in France. Doctors Ambard and de Martel, it is true, by following out the ideas of Paul Bert, were able to succeed in a few general anæsthesias with nitrous oxide under pressure; but their experiments were not pursued by others. Surgeons were of opinion that nitrous oxide was suitable only for quick extractions of teeth. The reasons for this neglect are easy to find. Not only was the gas impure that was made, but very few surgeons then understood the importance of

entrusting skilled anæsthetists with its manipulation. Moreover, surgeons accustomed to the Ombredanne apparatus were loth to abandon it for one they thought complicated.

There were two things to be done in order to succeed better in any further attempt at rehabilitating the claims of nitrous oxide. One was to awaken a real interest among French surgeons; the other was to invent a simple and portable apparatus suitable for nitrous oxide anæsthesia. This was what Dr. Desmarest did. With the aid of his pupil and friend Dr. Amiot he invented the apparatus and for the last thirteen years, daily use has been made of it in Dr. Desmarest's hospital service, first by Dr. Amiot in 1919, and since then by the anæsthetists Dr. Dumont (1920–1930), Dr. Joffroy and myself, in thousands of operations both of minor and major surgery. Twelve years have elapsed since the first publications of Dr. Desmarest and of Dr. Dumont on the employment of nitrous oxide, and we deemed it interesting to inquire whether this excellent method of anæsthesia could now claim to have some adepts.

We find their number small. In the replies made to our letters concerning French anæsthetic practice, very little is said about nitrous oxide. We may say, indeed, that most French surgeons either know nothing of it as an anæsthetic or else condemn it. A few make use of it for certain patients who ask for it. Professor Lejeune tells us he had recourse to it occasionally a few years ago, but has completely given it up; unfortunately he does not explain why. We know also that Dr. Heitz-Boyer is reported to have had serious trouble in employing this gas, as likewise Dr. Trèves, one of whose female patients, 80 years of age, died when this anæsthetic was used in an operation for the reduction of a fracture of the olecranon. Dr. Legrand, of Rouen, tried the gas but did not continue employing it. However, it is not so much such exceptional accidents as inferior operative facilities which have discouraged French surgeons from making use of the nitrous oxide oxygen anæsthetic method. Among the minority of its defenders we may mention Doctors Labey, Chifoliau Jayle and Dumas. Labey uses it in conjunction with Schleich's mixture. Jayle prefers it for anæmic patients or in long operations. Dumas uses in general only nitrous oxide anæsthesia and is quite satisfied with it. If exceptionally he has recourse to the spinal method of anæsthetizing, it is only in very difficult laparotomy and in the reduction of fractures. Hertz in 25 per cent of cases

uses nitrous oxide, as also Leo. The latter when he cannot obtain the services of a special anæsthetist replaces gas by ether. Louis Michon, of Paris, often uses nitrous oxide, reserving it for operations on the bile ducts and for patients whose liver functions are easily deranged; in other words, about 5 per cent to 10 per cent of cases. Dr. René Le Fort uses gas but little, as he finds it is not easy to get good anæsthetists.

Not so long ago, Dr. Desmarest succeeded in forming a group of doctors who took lessons in anæsthesia with his assistant Dr. Dumont, before he died, and hoped that this would lead to the training of professional anæsthetists in numbers sufficient for the demand. But he soon discovered that practitioners complained of inconveniences encountered in nitrous oxide anæsthesia from the operator's point of view—increased blood pressure, therefore greater bleeding; fuller breathing, therefore an abdominal movement sometimes troublesome; incomplete muscular relaxation, therefore undeniable difficulty in suturing muscular surfaces. Evidently to deal with such inconveniences when met with requires much patience in the surgeon, who is often lacking in this respect. Dr. Desmarest's opinion has been and still is that nitrous oxide anæsthesia is administered first and foremost for the patient's benefit, not for that of the surgeon.

For the reasons above cited, acetylene and ethylene anæsthesia are not in favour. Yet Drs. Papin, of Paris, and Ambard, as early as 1924, demonstrated that ethylene is a more powerful analgesic agent than nitrous oxide. But routine is such, both as regards anæsthesia and anæsthetists, that Dr. Desmarest was never able to get his assistant, Dr. Dumont, to give him a narcosis with ethylene.

During the last few years, under the influence of what the German School has done, we have seen the creation of a fresh technical method for obtaining anæsthesia—that which begins the narcosis by injecting avertin into the rectum.

We do not intend to treat here the question of avertin—administration whose advantages have been set forth in France by Dr. Gosset and his pupil Thalheimer, by Dr. Desmarest in an article published in 1931 by the *Brussels Medical Journal*, as also in another article which appeared this year in the *Presse Médicale*. The success of the first results was so great that French makers of pharmaceutic specialities hastened to place on the market what is called rectanol, which is a French preparation of avertin.

Although basal anæsthesia by means of avertin is of recent application in France, it seems likely to enjoy a certain popularity. Calming the patient's fears before operation, it spares him in most cases post-operative pain, and more particularly the nausea and vomiting so painful after laparotomy. The surgeon is not inconvenienced by it since it reinforces the complementary anæsthetic's action. Drs. Gosset and Thalheimer use it together with ether. Other surgeons replace the ether by Schleich's mixture. Dr. Desmarest was the first in France to demonstrate the increased value of nitrous oxide when employed with avertin, since this remedies the inconveniences of the gas mentioned already without altering its virtues. Dr. Robert Monod, who sent us his anæsthetist when he began to utilize avertin, had accepted it at once as an adjuvant, and is to-day an advocate of our method. Gaudard d' Allaines writes us that, when he premedicates with an avertin enema, he uses for general anæsthesia either nitrous oxide or Schleich's mixture. Dr. Fredet, of Paris, who prefers numal to avertin as a premedicating adjuvant, has just adopted nitrous oxide as his complementary anæsthetic. It is thus that prejudices are overcome. In the third edition of a book on Infantile Surgery written by Professor Ombredanne, a whole chapter is devoted to avertin used on infants. Ombredanne hopes by this way of insensitizing a patient to avoid shock so serious at this age. Until now he has not formulated any conclusions.

Present tendencies are in favour of anæsthesia with premedicating adjuvants. To tell the truth this method has its origin in one that has been long practised, namely, injection with an alkaloid before anæsthetizing. There are very many French surgeons who make a point of calming the fear of their patients by giving them an injection an hour prior to a narcosis. The good influence of this sedative medication on the nervous system makes itself felt during the anæsthesia, which it renders smoother. In France research continues in this field. Desplas employs Soneryl by oral administrations, while Bréchot, we learn from a recent communication of his to the French Society of Surgery, advocates bromine.

Last of all must be mentioned the important role played by Co_2 in anæsthetic inhalation. In quite a recent communication to the French Society of Surgery, Professor Gosset says: "We are of opinion that CO_2 intermittently administered during an ether

narcosis improves its quality, permits the anæsthetist to diminish the doses of ether, and avoids lung complications. Patients assert that they are delighted with this kind of anæsthesia, and that they do not suffer from fear and sensations of choking as they did when anæsthetized by the usual method. This is partly because little ether is given and partly also because the reflex aroused by the CO_2 makes them breathe more deeply and go to sleep more rapidly. It is especially at the beginning of a narcosis that Co_2 renders service by accelerating its progress.

To conclude, it is possible to gather from the necessarily incomplete statement we have made that most French surgeons are eclectic in their opinions concerning anæsthesia, at any rate when general. They agree, however, in using local anæsthetics only in minor surgery. On this point, we ourselves differ, believing, as does Dr. Desmarest, that the introduction of a chemical substance into the tissues is not without serious risk. For instance, if a whitlow is to be incised, nitrous oxide anæsthesia seems to us superior to one induced regionally or locally. The chloride of ethyl which so many surgeons use is surely more dangerous to the patient than a short nitrous oxide narcosis.

Most supporters of spinal anæsthesia advocate it in cases of pelvic surgery in addition to those in which the lower parts of the body are to be operated on. If we may allow ourselves to make a relevant remark here, it is to express our surprise that so many surgeons should prefer it in major surgical operations.

For any one who knows the great shock to the system from long and painful operations always involving a more or less considerable loss of blood, it is difficult to believe that recourse should be had in these operations to the anæsthesia that especially lowers blood pressure. In our opinion it must increase shock, and, on account of this, should be condemned as dangerous.

Ether narcosis has its very real risks, the pulmonary complications that ensue so often are admittedly fatal in many cases. To one of our correspondents who seems to think that ether is sometimes accused of causing accidents which ought not to be imputed to it, we reply that observations can be furnished by Dr. Desmarest concerning operations with ether in other hospitals, after which patients have suffered from inflammation of the lungs, have been apparently

cured, and have been obliged to return to the hospital suffering from abcesses in the lungs.

Anæsthesia is not a thing to be considered lightly, and needs all the attentive experimentation and study devoted to it, unfortunately more in other countries than in France. Its main principle should be —the suppression of fear and pain in the patient without injuring his organism.

To this principle, to this double aim, anæsthesia by means of nitrous oxide combined with oxygen and avertin seems to conform. For its proper employment, however, it requires that the anæsthetist should be not only skilled but always careful, able rightly to judge each patient and rightly to judge for each the dosage of gas he is using every instant. It is now everywhere understood, except perhaps in France, that anæsthesia should be entrusted to specialists only. At the 1930 Congress of the French Surgical Association, Dr. Auvray urged this desideratum on his audience; and it is a hopeful sign to be noted that our young French surgeons are beginning to call in professional anæsthetists for their operations. A little longer to wait and we shall have, no doubt, in France, as elsewhere, our anæsthetic journals and, what is more, our anæsthetic schools.

MODERN AIDS TO ANÆSTHESIA.

(Abstract from a Paper read at the Royal Society of Medicine).

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IT is a well known fact that the adoption of nitrous oxide, ether and chloroform, as agents for the production of general anaesthesia dates from the years 1844, 1846, and 1847, respectively. It has always appeared to me curious that after many centuries of search these three wonderful drugs should have come into the field within such a short space of time. It is perhaps still more surprising that concentrated research during the nearly ninety years that have elapsed since then has not resulted in offering us any other bodies comparable in value to the three major agents. Many other drugs have been found to possess anaesthetic powers, but with two exceptions all appear to be associated with drawbacks of one kind or another which have prevented their general use. The two exceptions are, of course, ethyl chloride (and similar bodies) and ethylene. Ethyl chloride is a most valuable anaesthetic, one which I use largely myself, but of limited application, and certainly not comparable to ether or chloroform. The position of ethylene is more difficult to determine. I am naturally interested in the matter myself as it was the Joint Anaesthetics Committee of the Medical Research Council and this Section that, with some difficulty, persuaded the British Oxygen Company to undertake the manufacture of ethylene for anaesthetic purposes in this country. It is obvious that the demand for anaesthetic ethylene has not been as great as was anticipated and that from a commercial point of view the manufacture has proved disappointing. It is perhaps significant that in the new surgical block at St. Bartholomew's

Hospital where nitrous oxide, oxygen, and carbon dioxide are stored in the basement and are thence "on tap" in all theatres and anaesthetic rooms, ethylene has not so far been included although the pipes are there ready for its adoption.

It is probably fair to say that the unpleasant odour and the very real danger of serious explosion have discouraged anaesthetists from replacing nitrous oxide by ethylene in spite of the better muscular relaxation afforded, and the fuller oxygenation allowed. In the United States the use of ethylene appears to be far more general notwithstanding the fact that the dry atmosphere prevalent in many parts of America renders the danger of explosion greater.

What has just been said as to the discovery of anaesthetic agents is, of course, true only for general anaesthesia. In the realm of local analgesia the story has been a very different one. Since the introduction of cocaine as a local anaesthetic in 1860 the advances made in this subject, both as regards the introduction of new agents and the technique of their use, has been truly marvellous.

I wish to refer now to what are termed "basal anaesthetics."

These basal anaesthetics are administered to the patient by the mouth, by the rectum, into the blood stream, or intramuscularly, with the object first of sending him to sleep or rendering him so drowsy that he is either unaware of the administration of the general anaesthetic or so somnolent as to have no apprehension of it. Secondly with such preparations it is usually found that the amount of general anaesthetic required is sensibly reduced and often that a less toxic agent can be substituted with satisfactory results.

Any basal anaesthetic that will do either or both these things for us is an agent of extreme value and the various drugs now at our disposal are usually entirely successful. But I am not quite convinced that we have reached finality in the matter or that any particular preparation yet in our hands can always be relied on to work efficiently and with no disturbing after effects.

Paraldehyde.

I suppose about the earliest of these basal anaesthetics was paraldehyde, administered rectally either in oil or saline solution. Not long ago we had here an excellent paper on the use of rectal paraldehyde in saline at the Hospital for Sick Children. Not only are the children frequently almost unaware that they have undergone an operation but it is also found that vomiting and other unpleasant post-anaesthetic sequelae are absent or much reduced. In adults it seems to be almost equally successful though perhaps not so certain in its results. Its action in saline is both quicker and surer than in oil, but its relative insolubility in the former makes the bulk of fluid to be introduced inconveniently large. Here, as with other agents given by the rectum, success is largely dependent on the skill shown both in the preparation of the patient and the introduction of the drug. I am puzzled why paraldehyde is not more used than it is, not only by others, but by myself. Few anaesthetists apparently employ it at all regularly. It appears to be a particularly safe drug and the only fatality of which I remember hearing was one in which eight times the prescribed dose was given in error. It seems free from undesirable after effects and the disadvantage of smell is hardly a serious one administered in this manner. I am not at all sure that it is inferior to avertin and it is certainly safer.

Avertin.

Avertin is perhaps the most popular basal anaesthetic at the present day—at any rate in the public mind. It was not until the results obtained by other workers had been carefully collected and collated by Dr. Blomfield and Sir Francis Shipway and added to their own extended experiences in a guarded but on the whole favourable report that avertin was, so to speak, "released" in Britain.

As far as I know no one now ever uses avertin as other than a basal anaesthetic to be reinforced later by some form of local or general anaesthesia. It is true that not unusually, with basal doses only, the patient may be so deeply asleep alone, but this is the exception rather than the rule. My general experience is that the action of the drug is adequate and satisfactory when the amount is limited to the well defined

dose *per* body weight table. The action of the appropriate dose on apparently similar patients is often very variable. One may be deeply asleep while the next appears little affected. I say "appears" advisedly because such a patient is usually far more amenable to the smallest doses of other anaesthetics than he would have been without the avertin. I have known a case given the same dose of avertin by the same skilled sister with the most diverse results, there being an interval of only a week or ten days between the two operations. In the first instance he was deeply asleep but on the second occasion, in spite of himself expecting to drop off at once, he arrived in the theatre in a state of acute terror.

It is this uncertainty of action that seems to me to be one of the real disadvantages not only of avertin but of most other basal anaesthetics. We know well that different patients react differently to all drugs, and perhaps to anaesthetics in particular, but I feel that this is much less the case with chloroform, ether, or even nitrous oxide than with our basal anaesthetics. This is no doubt due to the fact that we are dealing with what might be described as a narrower threshold. Still, I am not without hope that the researches of chemists will yet find a subtsance or substances of more dependable action.

The danger of overheating avertin solution has probably been exaggerated, and wisely so, as it appears to be more stable than was at first suggested. However, the congo red test should never be omitted. "The prospect of a lot of hydrobromic acid and dibromacetic aldehdye and rectal mucous membrane in close proximity, is what no man can face with equanimity." In good nursing homes and hospitals the actual administration is, I think, best left to a competent Sister but the fact that the anaesthetist should always be within call may give rise to difficulty.

A more serious trouble is the occasional occurrence of unpleasant after effects which seem definitely to be due to its action. These may vary from a vague feeling of depression and distress to more serious and objective symptoms sufficient to cause real anxiety. I can best instance what I mean by brief reference to one case. I had occasion to give an anaesthetic to a healthy young doctor for the radical cure of

a small inguinal hernia. As he had recently recovered from an influenza attack with marked bronchial symptoms he elected to have avertin reinforced by nitrous oxide and oxygen. The operation was quite uneventful, the small sac being readily found and tied without the bowel being handled in any way. No ether or chloroform was given. Yet for some reason or other the first few days of convalscence were most anxious ones owing to the meteorism and partial obstruction that developed.

The Barbiturates.

Avertin scarcely had time to get itself well established as a basal anaesthetic before we began to receive from America and elsewhere various barbituric acid compounds which give comparable results. Anaesthetists have at present given chief attention to three of them. They are sodium amytal, pernocton, and nembutal. Their action is so similar that they may be considered together. In general terms it may be said that sodium amytal gives a longer hypnosis and is possibly less readily excreted than nembutal. In both respects pernocton may perhaps be placed between the two. Nembutal can be administered either orally or intravenously. The intravenous method is more certain in its results but is necessarily rather more troublesome both to patient and anaesthetist. For this reason I, personally, give nembutal by the mouth and am on the whole fairly satisfied with the results obtained from quite minimal doses—usually amounting to three grains for an ordinary adult. In a fair series of cases I should say that one-third were unaware that they had been moved to the operating theatre, another third were aware of the fact but were too sleepy to be troubled by it. The remainder appeared little affected by the drug but were usually in quite a placid condition. What is most noticeable in nearly all cases is that relatively good muscular relaxation can be obtained with gas and oxygen combined with far less ether than would be required without the basal anaesthetic. Here I think we have one of the greatest advantages offered by both avertin and the barbituric acid group—the increased susceptibility to the action of nitrous oxide. I have formed no definite opinion as to whether avertin or the barbiturates exhibit this in the greater degree. More certain results can, of course, be

obtained by increasing the oral dose of nembutal but I am inclined to caution in this matter. I have always been very suspicious of the barbiturates since the first introduction of veronal many years ago. In suitable cases I have found it a good plan to give one capsule of nembutal overnight and to decide whether to give two or three capsules prior to operation according as the first dose has had an obvious or a negligible effect.

The barbiturates in midwifery seem satisfactory. Sodium amytal appears to be the best of the three owing largely, no doubt, to its more prolonged action.

As with avertin their use is not always unattended by sequelae. Even when the dose given has appeared to be well within the limit of safety the patient will sometimes continue to sleep, and sleep deeply, for a period sufficiently long to cause grave anxiety as to his ever waking up. I have been a little anxious on this score myself in one case and recently I heard of another—where the anxiety was justified by the fatal issue. Again in other instances, mostly, I think, acute abdominal ones, symptoms similar to those sometimes following avertin have supervened. Possibly all such events are due to coincidence, and have really no connexion with the basal anaesthetics employed, but one seems to hear of them too frequently to accept such an explanation without grave doubts.

A minor but still a troublesome complication is the marked restlessness that may precede full return to consciousness. I have been told of cases where it was so pronounced as to require the injection of such doses of morphia or hyoscine as would have given a deeper basal anaesthesia than the barbiturates if given in the first instance. With nembutal the restlessness seems less frequent than with the others and personally I have not met it in a troublesome degree.

Another effect not unnaturally produced by the barbiturates and indeed all basal anaesthetics is depression of the respiratory centre. In some cases the breathing becomes so quiet and shallow that the patient scarcely inspires sufficient anaesthetic to secure surgical anaesthesia and also, of course, becomes unpleasantly cyanosed. Presumably this cyanosis is due to a diminished sensibility of the centre to

stimulation by ordinary percentages of carbon dioxide. I have never, however, found this depression sufficiently marked not to respond readily to treatment by added carbon dioxide combined with oxygen.

A point worthy of attention is, I think, the action of the barbiturates when used in conjunction with chloroform. As far as I can remember I have never had occasion to make use of this combination, but my attention was drawn to it by reading an interesting case reported by Mr. H. F. Griffiths, of Folkestone, in the *British Medical Journal* last July. The patient, a man of 11 stone in weight, was given 3 grs. nembutal orally, and 1/50th. gr. atropine hypodermically, before an operation for the removal of a papilloma of the mouth by diathermy. He was given light chloroform anaesthesia, from a Junker, for about 20 minutes and this had to be repeated some three hours later to control a reactionary haemorrhage. As a result the patient did not fully recover consciousness for about three days.

Carbon Dioxide.

The mention of carbon dioxide in connexion with the barbiturates reminds me that it should not be omitted from any discussion on modern aids to anaesthesia. Perhaps it deserves inclusion as much as, or more than, all the rest put together. Other drugs that I have mentioned are of great assistance both to the patient and the anaesthetist but carbon dioxide is not only this, but may be of primary importance as a preventive of disaster. I am wholly convinced of its usefulness and ignorant of any corresponding disadvantages. I need hardly say that, as in the case of oxygen, I am always discouraging its indiscriminate use to correct faults in administration which should never have arisen. I would emphasize that no student should be allowed to get into trouble owing to overdosage or respiratory obstruction simply because the fault can be corrected later by resort to carbon dioxide and oxygen.

The de-etherization of patients by carbon dioxide and oxygen is a most valuable procedure, and yet it is one which I hesitate to use as a routine. The efficiency of the method is beyond question but its very success involves the rapid return

of the patient to consciousness. He is thus subjected to a good deal of post-operative pain and discomfort which would otherwise have been passed through during a more or less prolonged period of insensibility. Therefore I tend to confine de-etherization to cases unlikely to be attended with much post-operative pain and to those where other special considerations render the method particularly desirable.

Although the respiratory stimulation caused by carbon dioxide is so certain that I often refer to it as the most convincing physiological experiment that I know, I think that it is well to realize that it cannot be expected to work miracles. The function of the carbon dioxide is to stimulate the respiratory centre but when that centre has been depressed beyond a certain point by shock, haemorrhage, overdose, or any other condition, it is not fair to expect carbon dioxide to accomplish the impossible. In other words when the trouble is due, not to lack of carbon dioxide as a stimulus, but to the loss of the power of the centre to respond to a stimulus which is already there in abundance, we cannot expect the exhibition of a still greater amount of stimulus to cause any relief. Another obvious point is that the administration of carbon dioxide to a patient who had ceased breathing is quite valueless unless artificial respiration or some other means of introducing the gas into the lungs is adopted.

The use of carbon dioxide as a cure for hiccoughs hardly comes into our subject but I should like to record, as a matter of interest, that in the only two cases I remember where distinct hiccoughs have developed during surgical anaesthesia the administration of carbon dioxide and oxygen has, to my surprise, entirely failed to stop the movements.

Synergistic Methods

Another modern aid to anaesthesia which merits our attention is the increasing use of so-called synergistic methods. These vary from quite simple combinations such as the almost invariable association of one or more hypodermic alkaloids with general anaesthesia, to other far more more complicated ones in which local infiltration, hypodermic medication, intravenous injection, and/or rectal injection, and light general anaesthesia are all administered for a single

operation. The results are frequently excellent but as with simpler methods that I have described they necessarily vary even more than those of any one of these aids taken singly. When all goes well the combination proves excellent, but in those patients with whom any trouble is encountered it may be difficult to decide upon the appropriate action necessary. Whether the resulting anaesthesia be too light or too deep, whether it be the respiratory or the circulatory system which is giving anxiety, it must be difficult to decide which of the drugs administered is either under- or over-acting its particular part. If this is so it must be impossible to decide with certainty the line to be adopted to correct the fault.

I feel it is better to limit the number of drugs as far as possible. For instance, when using spinal analgesia I like to combine it with some form of "twilight sleep" medication but in most cases I avoid superadding the use of nitrous oxide and oxygen. The use of local or regional infiltration in combination with light general anaesthesia is frequently invaluable in bad risks but often it tends to prolong the operating period unduly. So much may this be the case that the patient receives as much anaesthetic, if not more, as he would have done had the operation been quickly performed under ordinary surgical anaesthesia. I am convinced, however, that the combined use of avertin and local infiltration, with or without gas and oxygen anaesthesia as it may be required as the operation proceeds, must have saved the lives of many patients with toxic goitre so advanced as to render surgical interference with an ordinary anaesthetic impossible.

Pure Gas and Oxygen.

I am not at all sure that in straining to attain the so-called ideal of pure gas and oxygen anaesthesia we are not often making a mistake—at any rate so long as we are content to work under normal external atmospheric pressures. Could we increase these pressures adequately to saturate the blood with a higher percentage of nitrous oxide it is probable that we should obtain almost perfect results. As you know experiments with high pressure operating theatres and operating boxes have been successfully made in the past. I have never been able to find any definite account of these experiments,

but however good the results may have been in individual cases the very fact that they have not continued proves that the difficulties must have been greater than the advantages.

Working then at ordinary pressures I have often wondered whether these pure gas-oxygen anaesthesias are really to the advantage of the ordinary patient. In badly shocked and moribund cases the merits of the method are unquestionable. How many thousands of lives must have been saved during the War by the use of pure or nearly pure gas and oxygen? But such patients have largely lost the normal resistance to nitrous oxide anaesthesia and so succumb to its influence quite differently from patients in normal or slightly sub-normal health. The use of such an easily eliminated anaesthetic almost entirely prevents those metabolic effects produced by ether and chloroform which are particularly dangerous to patients suffering from extensive trauma or sepsis. But what about the psychic shock which results, I suppose, from the incomplete abolition of the pain and other similar impulses reaching the brain from the site of operation? The success of the method of so-called secondary saturation with which I am personally entirely unacquainted, depends, I take it, to some extent on converting my second class of patient into the first or in common phrase in "knocking him out." Such a procedure does not seem to me to be a sound one. I cannot help feeling that many of the successful pure gas and oxygen cases result in more strain to the patient than he would have received had a minimal quantity of ether been added. Only the other day a surgeon complained to me that he had been obliged to stop twice during an operation owing to the shocked condition of the patient who was being anaesthetized with pure gas-oxygen plus a basal anaesthetic. I expressed surprise, saying that I seldom found this particular operation to be associated with much shock. He at once replied, "No, because you have them sufficiently under ether to prevent the shock impulses which were not eliminated by the methods used in this case."

Unfortunately nitrous oxide in itself is not a perfect anaesthetic although it very nearly attains that standard when a trace of ether is added. I think it better for the patient, in an ordinary case, to use this ether and make no secret of it.

I believe that the temporary and usually very slight added discomfort of the patient is more than counterbalanced by the advantage.

After all, to go to the very root of the matter, is nitrous oxide really a genuine anaesthetic at all? That it is a first class amnesic there can be no doubt but I cannot be sure that the body subjected to painful stimuli under its influence is really unaware of, and unaffected by, those stimuli although the patient has no recollection of them. One only has to think of the more or less involuntary movements and cries often witnessed in the dental chair to realize that the body must be aware of what is going on, even though the patient is unconscious of it, and retains no recollection of it. Of course the obvious criticism of this is that in such a case the nitrous oxide is not properly administered. This may be so but how many of us are so skilled that we never see such manifestations?

I have had nitrous oxide administered to me for the extraction of teeth on many occasions by some of my most skilful and experienced colleagues. They tell me, possibly truly, that I take gas quietly and well. They say, however, that I tend to become pale, even rather disturbingly so. From this quietude and pallor I assume that I am well under the influence of the gas. But what are my own sensations? As a rule I remember nothing at all of the extraction and from that point of view the administration has been entirely successful. But I do feel, and invariably feel, that I have been through a period of most excessive, and so painful, strain. I have been an Atlas trying to hold a World on my shoulders, and doing so with an effort so considerable as to be in the last degree distressing. Does not this mean that my brain has received all the pain impulses to a full degree although unable to react to them and remember them in detail? I think so. I had a single tooth extracted under nitrous oxide given me by a most skilled anaesthetist. Beyond my usual sensation of past strain I felt nothing. Some weeks later I was sitting in an armchair reading a novel. There was nothing in the book to suggest this trifling extraction nor to the best of my knowledge had I thought of the matter for many days. Suddenly, for no reason that I could discover, I remembered a sharp boring pain in my jaw which was immediately re-

ferred in my mind to the extraction of that particular tooth. There was no doubt about it, I was remembering the pain that I had unconsciously felt when that tooth was extracted some weeks before. My sub-conscious mind had received that very definite painful impression and in some inscrutable manner had suddenly turned it up weeks later.

ANÆSTHESIA FOR INTRA-ORAL SURGERY.*

By D. S. Middleton, M.D.

It is difficult to work out a standardized routine for operations within the month, however desirable this may be in theory, for so many of them present individual difficulties, deriving either from the patient or from the operation, which have to be surmounted in a variety of different ways.

It is upon some of these difficulties, and if I may say so, the personal aspect of such anæsthetics, that I wish particularly to concentrate rather than on the general principles.

Two types of anæsthesia are required. In the first place, a short or even momentary anæsthesia as in many dental procedures, or for the removal of tonsils and adenoids by the gillotine method; and secondly, an anæsthesia which may be prolonged indefinitely and where very often the anæsthetist himself must be away from the field of operation.

Here, at the risk of repetition later on, I would like to consider some aspects of dental anæsthetics.

The first essential is to get information from the dentist of what he purposes to do, and the length of time he thinks this will take; but always be prepared to give him rather longer, for I find that many dentists are optimistic persons and seldom anticipate or allow for the breaking of a tooth. It is no bad thing to have a suitable rejoinder for the man who, having failed to dislodge a tooth under a simple administration of nitrous oxide and oxygen, asks you to give the patient a " whiff of ether " and in the same breath expresses the hope that you are not going to leave the patient on his hands for half the afternoon as he has someone else due in fifteen minutes time.

The ease and certainty with which dental operations can be performed, one might almost say without exaggeration their very

* A Paper read before the Scottish Society of Anæsthetists.

success itself, depends largely upon the ability of the anæsthetist both to handle the patient, to co-operate with the dental surgeon, and to secure an easy and adequate anæsthesia.

The Extraction of Teeth in Children.

A simple administration of nitrous oxide and oxygen allows about 30 seconds available anæsthesia and, if it has been possible to put a prop in position is sufficient to allow two or three temporary teeth to be extracted. If longer time be required the addition of a small dose of ethyl chloride, from 1 c.c. to 3 c.c. will give about 90 seconds. When the child's mouth is in very bad condition and there are several roots in addition to the four six-year-old permanent molars to be removed, I find it best to induce with ether until the child is fully anæsthetized. This has the disadvantage of causing more upset but it allows the dental surgeon adequate time to do his work thoroughly.

Many children, especially those who have been anæsthetized before, are very apprehensive, and require a great deal of reassurance, and the majority are always easier to handle without their mother or nurse. If the latter wish to be present, allow them to stay only until anæsthesia be induced, and then insist on their leaving the room.

When possible a prop should be placed between the teeth. This often requires considerable tact and exercises the persuasive powers of the anæsthetist. If this should be impossible the dentist can usually open the child's mouth with his fingers, but one should always have a suitable mouth-opener, one the jaws of which, when closed, are one behind the other presenting a thin edge to be introduced between the teeth.

In using N_2O and oxygen I always prefer not to have the bag full or distended with gas; it is always unpleasant, and for children terrifying to have a blast of gas full in the face.

I do not myself advocate the use of continuous nitrous oxide and oxygen in children under the age of eight. Many of them suffer from varying degrees of nasal obstruction due to adenoid tissue, and, added to this there is the difficulty of maintaining free nasal respiration with the dentist's fingers working in such a small space; he is apt to push the tongue back and depress the jaw unduly, causing a rapid onset of asphyxia. In addition children do not stand limitation of oxygen for any length of time.

For adults the nitrous oxide oxygen and ethyl chloride mixture is perfectly satisfactory for short operations. Where longer time is required ether may be added to this sequence. A mixture of 3 c.c. of ethyl chloride and 3 c.c. of ether in a glass tube evaporated by means of hot water into a two-gallon bag of nitrous oxide with sufficient oxygen to maintain a good colour will, in the average case, give an available anæsthesia of between 3 to 4 minutes, sufficient time for many dental operations.

If still longer anæsthesia is required, the ether may be re-applied before the patient regains consciousness, and in this way by re-application he may be anæsthetized for an hour or more, allowing the dentist to perform the more difficult extractions, such as an impacted mandibular third molar in a patient whose masseter muscle is well relaxed—a most important point as regards access.

The disadvantages of this method are obvious. There is a prolonged recovery time, and the patient may have to rest for a considerable time before going home.

The ideal anæsthetic, however, in my opinion for these longer dental operations in adults is undoubtedly intra-nasal gas and oxygen with ether added in those cases where it is necessary.

Its advantages are sufficiently well known to make it unnecessary for me to enlarge upon them, but in particular the post-operative upset is minimized.

I prefer oxygen with it rather than air, for I think the anæsthesia is smoother and the patient can be kept much lighter. The method has, however, definite limitations. While admirably suited to adults of reasonably good temperament and temperate habits, it is often impossible to maintain anæsthesia by nasal gas and oxygen for long in strong muscular young men or in people addicted to alcohol unless the precaution has been taken of some sedative premedication.

In such cases I admit the dental surgeon may succeed in extracting a few teeth, but it is probable that asphyxia plays a greater part than any anæsthesia, and I certainly do not advocate a blind persistence in this method when the addition of ethyl chloride or ether is so simple and upsets this type so little. Further, when muscular relaxation is desirable as in the extraction of mandibular third molars which may take from two minutes to an hour, for a smooth and satisfactory anæsthesia the addition of a little ether becomes almost a necessity.

The other type of patient where it is not entirely satisfactory is the one whose myocardium is degenerated or who is recovering from serious illness. The patient does not stand deprivation of oxygen, and if allowed to become cyanosed to the extent one permits in an ordinary case, may show quite a high degree of shock. It is safer in these cases to increase the oxygen and add some ethyl chloride or ether to maintain anæsthesia.

The other disadvantage I have in mind is an economic one. During an administration of nasal gas and oxygen lasting for from twenty minutes to half an hour, about 100 gallons of nitrous oxide will be used, making this a costly form of anæsthesia when compared with ether, and few people are willing to pay an adequate feee for a skilled anæsthetist merely to have a tooth extracted.

When using nasal gas difficulties may arise if the operation is commenced before the patient is fully anæsthetized, or again the operator may proceed with undue zeal and make it impossible to to maintain a clear airway. This latter usually occurs when lower molar teeth are being extracted and the lower jaw depressed by the operator, but sometimes the base of the nasal air-piece is pushed hard up against the nostrils during extraction of upper teeth. The remedy for this complication is simple, the anæsthetist should support the lower jaw, and a tactful reminder from him will usually prevent the partial asphyxia that one sees so often at the end of a nasal gas administration.

The patient should be made as comfortable as possible with the head and trunk in a straight line, and it is better than he should be sitting up, for thus the dentist is enabled to work in the way with which he is most familiar, he has more purchase over the lower jaw, and in most circumstances the available light is better with the patient in this position. The patient's head should be firmly fixed and his feet should be placed on either side of the chair to prevent him pushing himself up if any muscular movement should occur, which might happen if his feet were allowed to be against the foot rest. A long towel or strap which can be tightened after the patient is anæsthetized is useful in maintaining him steady in the chair. It is a wise precaution to ask him to blow his nose thoroughly first of all, to make sure that there is no very marked nasal obstruction.

The prop should be placed at the side of the mouth in order to allow the dentist access to the upper and lower jaw of the opposite side. If the dentist is going to operate on both sides as is frequently the case, the anæsthetist should be ready to insert a suitable gag, such as " Ferguson's ", and remove the prop, when the field is then cleared for extraction on the other side. It is most important that sponges being used should be replaced, when they become sodden with blood, by fresh ones. They diminish greatly in size when saturated with saliva and blood and in this form may easily be swallowed. I have found that honey-comb sponges about 3in. in diameter with a tape attached are very satisfactory for this purpose.

In ordinary dental anæsthetics no premedication is really necessary nor do I think it advisable except in specially nervous people; and further, I would condemn whole-heartedly the practice of prescribing any narcotic without first seeing the patient. Otherwise the ordinary precautions before any general anæsthetic should be taken—the bowels moved and the stomach practically empty.

If ether is going to be administered atropine is of the greatest assistance. I usually give 1/100 grain tablet with instructions to allow it to dissolve underneath the tongue three-quarters of an hour before the operation is timed to take place. Nembutal 1½ grains taken half an hour previously is a valuable adjuvant to the administration of nasal gas and oxygen in producing that placid frame of mind which is of so great assistance to the anæsthetist. It seldom upsets the average adult, but a certain amount of attention is required afterwards. For instance, such a patient is not in a fit state to drive away in his own car. I have known personally of one such patient, who to all appearances was all right and drove his car through two miles of traffic, and finally and fortunately for him committed his error of judgment at his own garage.

With such a wide choice of methods of administration I feel that there is no place for chloroform, invaluable though it may be in other circumstances, in dental anæsthetics, for it brings with it additional risks, which in my opinion are neither necessary nor justified.

There remain for consideration the anæsthesia for other operations in and around the mouth which are the province of either the ear,

nose and throat, or the plastic surgeon. For enucleation of tonsils with a guillotine a short anæsthesia is all that is required, in no way differing in requirements or possible complications from similar anæsthetics in dental cases. For these cases I use a one-gallon bag filled previously with oxygen and a single dose of ethyl chloride. If oxygen is not used, one has to admit air during the induction and often this is insufficient as many children have tonsils which meet in the mid line and form an almost complete barrier to respiration if the child become at all cyanosed.

For longer operations the choice lies between the endo-tracheal anæsthetic or an anæsthetic delivered into the pharynx, both of which are perfectly satisfactory. In dissection of tonsils my own preference is for intra-pharyngeal chloroform preceded by an ordinary ethyl chloride ether induction. This ensures a rapid induction and obviates the so-called dangerous period of chloroform anæsthesia. The anæsthesia is maintained by a stream of oxygen bubbled through chloroform in a Junker's bottle and delivered by a rubber catheter, the end of which should be opposite the epiglottis. Never let the operator commence until you are satisfied that the patient is fully anæsthetized and settled.

In certain cases it is difficult to maintain a sufficient depth of anæsthesia, and should the patient start to come out it is simply courting disaster to allow the operation to continue. The operator should at once be asked to stop and the anæsthesia deepened by placing a gauze swab over the patient's mouth.

There is no more trying circumstance than a patient coming round with a tonsil half dissected and the pharynx rapidly filling with blood from some vessel that has been torn across.

The use of oxygen instead of the hand-bellows has its disadvantages. More vapour is blown into the operator's face than when the bellows are used to pump during inspiration, and should there be any difficulty in maintaining a sufficient depth of anæsthesia, oxygen seems to increase this difficulty.

The chief point in its favour is the elimination of cyanosis and consequent decrease in haemorrhage.

The position of the patient is important.

A pillow should be placed underneath the shoulders and one underneath the head. This latter is removed when the patient is anæsthetized and the extended head rests on the table. Many people employ the Boyle-Davis gag, but I think the following arrangement gives the surgeon much better exposure.

The mouth is widely opened by means of a Waugh's gag inserted between the molar teeth. A pattern of this gag with spikes is made for use with edentulous patients. Furthermore, a gag which rests on the molar teeth is less liable to cause injury than one placed centrally. Both patients and dentists are very annoyed when a particularly fine piece of crown or bridge work is broken, necessitating a premature adoption of a dental plate.

The cheeks should be retracted by means of a small abdominal retractor and the tongue pulled forwards with a towel clip which hooks on to the retractor. This arrangement I have found to have immense advantages over the use of any other form of gag, for by pulling the tongue forward, one ensures a clear airway and the lower pole of the tonsil is brought at least an inch further forward than when a Boyle-Davis gag is used, which on the contrary tends to push the tongue back into the pharynx and to increase the difficulty of keeping a clear airway.

The control of haemorrhage is more the province of the surgeon, but the anæsthetist can be of great assistance in swabbing and keeping the field of operation clear. To this end some surgeons inject ½ per cent novocain with adrenalin; nor have I ever found that this procedure gave rise to any anxiety, even during chloroform anæsthesia.

Ten per cent cocaine is used and the patient is instructed to inhale the atomized vapour. Two puffs of vapour are sufficient to diminish the sensibility very markedly and in addition enable one to keep the patient much lighter and prevent gagging during the induction. Where for any reason one is desirous of using ether throughout, more satisfactory results in the adult are obtained with an endotracheal rather than intropharyngeal anæsthetic. If oxygen be used to deliver the ether vapour some sort of re-breathing bag with an expiratory valve is necessary in order to maintain a proper CO_2 balance. As

one limits the flow of oxygen to between 1½ and 2 litres per minute, one must ensure complete volatilization of the ether to obtain sufficient strength of vapour to maintain anæsthesia.

The tube or catheter may be introduced via the mouth using the direct laryngoscope or by blind intubation through the nose. In many cases, if the patient is lying with his head in line with his body or slightly flexed, a well lubricated rubber tube will pass directly into the trachea. Difficulty in blind intubation may be experienced, due either to deviation of the septum or to an unduly narrow nose or where the end of the middle turbinates are enlarged. In the latter case a sniff of cocaine from an atomizer or chlorotone inhaler decreases the congestion which is usually present in these cases.

When the tube fails to pass between the cords into the trachea it may lodge in the vallecula or in one or other pyriform sinus or may be held up by spasm of the glottis. In many of these contingencies one has to pass a direct laryngoscope and guide the tube between the vocal cords either by manipulation of the end protruding from the nose, or by picking up the end in the pharynx with a suitable forceps.

It is unnecessary to wait too long in cases of spasm of the glottis, for if the catheter be truly in the mid-line a sharp tap is sufficient to cause it to pass between the cords and can do no harm.

The most difficult cases of all are undoubtedly patients who suffer from kyphosis and the short-necked plethoric type of individual, for in them it is extremely difficult to get an adequate view of the larynx.

The complications which may supervene upon intubation are in the first place subglottic œdema. This is mainly due to the use of oversize tubes, and such tubes in addition may cause some hæmorrhage in the nose which is quite liable to be followed by adhesions. Secondly, if the patient's position is faulty during the introduction of the catheter it may pass down the œsophagus and if not noticed and the anæsthesia proceeded with may give rise to dilatation or even rupture of the stomach, and lastly, any undue force may cause trauma to the sensitive larynx which may have the most undesirable sequelae.

In many cases patients who have been intubated may suffer from a slight laryngeal congestion which causes hoarseness. This, however, is usually only transitory. In any case it can hardly be taken as a serious objection as it is liable to occur after any anæsthetic. There is only one contra-indication to intubation via the nose, and that is a previous history of antral infection. In such a case the oral route is certainly to be preferred.

The commonest plastic operation for which one has to anæsthetize children is the closure of cleft palates and hare-lips. For these cases I always use pharyngeal ether delivered by a catheter, introduced down the nose or else by an attachment on the gag. It is difficult sometimes to get a sufficiently strong vapour of ether, especially if one is using oxygen as the carrying agent.

I use an intra-tracheal apparatus which has a hot water container to evaporate the ether, also has a chloroform bottle in the circuit, and I must admit that on the occasions when my ether vapour has not proved strong enough, generally a child of five or six years of age, I have saved the situation by making use of this.

Up till now I have made no mention of rectal anæsthesia, which undoubtedly has its place, provided one has sufficient time to supervise personally its administration. I personally prefer to administer an anæsthetic over which one has full control, and have never felt happy with rectal anæsthesia.

Where children are very nervous, I find that luminal, one grain per 14lb. body weight is the most satisfactory preliminary. I have used pernocton in about 100 adult cases and find that it works exceedingly well, but my preference is undoubtedly given to scopolamine and morphine, my experience of nembutal not having been a very happy one.

The effect of nembutal on different patients is so uncertain that with three grains some people sleep for a whole day and others are apparently unaffected. Recently I had occasion to anæsthetize a lady for the second time. On the first occasion she was given, at the wish of the surgeon, nembutal grains 1½ the previous night, and three grains in the morning, one hour before the operation, along with ⅙ of morphine and 1/100 of atropine.

She was quite asleep when she came to the table and from that point of view the administration was extremely satisfactory.

But a month later I had to anæsthetize her again, and in view of our previous experience she was given the same dose. This time she was wide awake and rather annoyed that she was not asleep when brought to the operating theatre, as on the first occasion.

My preference in big cases is undoubtedly for 1/100 scopolamine and ¼ morphine, followed in half an hour by 1/100 and ⅙. This I have found to be very reliable. I think it is a mistake to prescribe narcotics which are going markedly to depress the respiratory centre, and prolong the recovery from the anæsthetic after operations in the oral passages, however desirable they may be in other cases. A big percentage of the mortality in oral operations is due to inhalation pneumonia, and I think it is essential that these patients should recover consciousness as soon as possible.

THE LIVERPOOL SOCIETY OF ANÆSTHETISTS.

THE number of local societies of anæsthetists is still naturally small and we have much pleasure therefore in publishing the following short account of a flourishing specimen of this kind of enterprise. If there are others of which we are unaware we shall be glad to give them too the hospitality of our pages.

On the 16th July, 1930, The Liverpool Society of Anæsthetists was formed, having as its first President, Dr. A. J. O'Leary. The objects of the Society are to promote among the members thereof fellowship, mutual help, encouragement, co-operation, professional discussion and scientific advance; to formulate an organized policy and make recommendations for the furtherance of specialist anæsthetists. Only practitioners holding, or who have held, an appointment of anæsthetist at a hospital in the Liverpool district are eligible for membership.

The affairs of the Society are managed by a Committee elected at the Annual General Meeting, consisting of a President, Vice President, Secretary, and three other members, with power to add to their number. Representation of each of the four Liverpool teaching hospitals, and the special hospitals, is provided for on the Committee, and also that one member at least, if possible, shall be a woman.

The original officers of the Society, in addition to the President, were Dr. W. Bennett Jones, Vice-President; Dr. R. J. Minnitt, Secretary, and Drs. E. Christine Hanson, G. F. R. Smith, and D. P. H. Gardiner, members of Committee.

During the year 1931, three General Meetings were held, at each of which papers were read. There have been three General Meetings in the year 1932. At the first, held in January, the President delivered his address, entitled: "Who discovered Chloroform Anæsthesia, Simpson or Waldie?", and a new departure was introduced at the meetings in July and October, in that visitors from London were asked to contribute. In July, Mr. A. Charles King showed and explained the latest types of anæsthetic apparatus, and in October, Dr. I. W. Magill demonstrated his method of nasal intubation at The David Lewis Northern Hospital, Liverpool, by the kind permission of Mr. G. C. E. Simpson and Mr. J. H. Rawlinson, Hon. Surgeons.

The Society at the present time consists of twenty-six members and nine honorary members.

The annual subscription for members is half a guinea per annum.

ASSOCIATION OF ANÆSTHETISTS OF GREAT BRITAIN AND IRELAND.

THE first annual general meeting took place on October 28, 1932, at the House of the Medical Society of London. A large number of members attended under the presidency of Dr. H. W. Featherstone. Fifteen new members were elected by ballot and five honorary members, nominated by the Council, Messrs. Carter Braine, Richard Gill, F. J. Silk, Proybn Williams and F. H. McMechan. Drs. Gwathmey and Wesley Bourne were elected corresponding members. The Council's report was read, describing the formation of the Association, and the Council for the ensuing year was elected. A number of matters were mentioned which were engaging the attention of the Council of the Association. Amongst these were the appointment of local representatives for those districts which were at present unrepresented on the Council, the unsatisfactory position of visiting Anæsthetists who work with whole time surgical units in certain London hospitals, lght steel cylnders for carrying nitrous oxide and other gases. The Treasurer presented his report, showing a highly satisfactory state of the Association's funds.

SECTION OF ANÆSTHETICS.

(Royal Society of Medicine).

At the first meeting of the Session on November 4th the President, Dr. Charles Hadfield, opened a discussion on "Modern aids to anæsthesia." His paper, of which we give a résumé on pp. 62-73, was followed by many speakers. Dr. J. Blomfield described the use of sodium amytal by the mouth in the case of a patient who had to receive several painful manipulations in the course of twenty-four hours. He also raised objections to the term synergism and the process which it describes. Mr. R. E. Pleasance said that "gas and oxygen" preceded by avertin in his experience gave perfect results for all kinds of operations; a little ether might have to be used also in operations on the upper abdomen.

Dr. R. J. Minnitt said that impressions similar to those related by Dr. Hadfield in connexion with nitrous oxide might follow imperfect anæsthesia with open ether. He had employed carbon dioxide therapeutically to a lady of 84 years, suffering from emphysema and a failing heart, with great benefit.

Dr. H. G. Ashworth said that out of 300 cases with avertin there had been only two in which unconsciousness had not followed within twenty minutes of the injection; even in these two amnesia was complete. He pointed out that the congo red test was not infallible, as in the impure solution the colour change might not occur till after fifteen minutes. He advocated the addition of chloroform rather than ether when adequate muscular relaxation was not obtained with nitrous-oxide and oxygen after avertin. With regard to the use of nembutal in midwifery the occurence of a labour pain during intravenous injection usually interfered with its performance. Unpleasant sensations after nitrous-oxide inhalation were due to the rapid administration of the gas. Mr. Stephen Coffin said that efficient premedication abolished all unpleasant psychological sequelæ from nitrous-oxide inhalation.

Mr. I. W. Magill said that ethylene had definite advantages in thoracic surgery, but he had been driven to abandon it because of the smell being objectionable to most people in the theatre and because

of the increasing use of diathermy, with which ethylene was incompatible. With regard to barbiturates, in recently published experiments nembutal was placed first and pernocton last in order of efficiency. He used only the itravenous method for definite basal hypnosis, but by the mouth gave small doses to get the effect of ordinary premedication, Where muscular relaxation was essential avertin was preferable. Nembutal in safe dosage did not interfere with muscular tone; it simply produced amnesia. Avertin and paraldehyde were preferable to nembutal with children, because the intravenous route was impracticable and because they were less followed by restlessness.

ABSTRACTS.

Endotracheal gas oxygen anæsthesia. ***Anæsthesia and Analgesia,*** Sept.-Oct., 1932.

Damage to the air passages due to endotracheal administration is rare in expert hands. H. G. Griffith reports "forty-six cases of benign papilloma of the vocal cords following endotracheal intuba tion." He is uncertain whether the trouble is caused by damage during introduction of the tube or by pressure of a large tube against the cords for a considerable period of time. Waters has developed a method of closed circuit endotracheal gas-oxygen anæsthesia for lung surgery. He pushes the endotracheal tube past the bifurcation and into the main branches of the good lung, then he inflates a balloon at the bifurcation and thus produces closed circuit respiration in the good lung, and completely blocks off the lung to be operated upon. This will, it is thought, make possible operation on many cases in which the surgeon feared the danger of the patient being drowned by pus or blood from the affected lung.

Contribution to the prevention and treatment of postoperative broncho-pneumonic compications. Dr. Cosimo Leo *in Ann de Ital. de Chururgo.* Aug. 31, 1932, pp. 909 et seq.

The author summarizes a large amount of clinical evidence. He comes to the conclusion that for avoiding post-operative pulmonary complication the measure of major importance is selection of patients. This consists essentially in not operating, unless absolutely necessary, on any person in whom respiration is deffective for any reason, or in whom there is any inflammatory affection in the mouth, nasopharynx of larynx or trachea. The most important pre-operative preparation consists in securing absolute cleanliness of the oro-nasal passages. The author finds that post-operative pulmonary complications are most frequent after operations on the stomach and duodenum. Operations on the upper abdomen for gall bladder affections are strikingly free from these complications compared with the other upper abdominal operations. Generally speaking spinal and local anæsthetics gave better results than general anæsthetics from this point of view. Experimental investigations in dogs, the upper

abdomen being opened, showed the important influence of infection by the air passages; control animals escaped, but those that inhaled pneumococci were affected with bronchopneumonia, fatal in some instances.

The author puts great faith in the Trendelenburg posture. It should be employed, he maintains, whenever possible in abdominal operations and always for certain periods daily during convalescence. This position is advantageous because of the facility it affords for clearing the air passage of secretions, and of inhaled matters, such as particles of material vomited up from the stomach. The author then lays stress on the part which immobility of the diaphragm particularly its central portion, plays in the production of post-operative pulmonary complications.

Hydraulic bases of spinal anæsthesia. Dr. L. Ronse in *Le Scalpel*, Oct. 29 and Nov. 5, 1932.

The author states that two factors which prevent control of the anæsthesia are lack of knowledge of the currents of convection and of gravitation after the injection is made. If one could suppress these two currents one could create a stable zone of anæsthetic action. This, he maintains, is done by shaking up of the anæsthetic liquid into the cerebrospinal fluid, and by admitting a bubble of air in front of or behind the injected liquid. Also he states that the temperature of the syringe or of the solution is as important as the weight of the latter. To warm the syringe by the hand is enough to cause the anæsthesia to rise too hgh. These opinions are based on experimental work with coloured solution in glass and rubber tubes. The author believes that some of the accidents of spinal anæsthesia are due to excessive cerebral intra-ventricular pressure and cites a case in support of this opnion. He says that care must be exercised from this point of view not to inject too much air into the cerebrospinal space. By his method he claims to get good localization of the injected anæsthetic and he believes that duration of anæsthesia with spinal methods is only possible because of the lowered blood pressure preventing absorption.

The employment of spinal analgesia by hypobaric percain. Dr. L. Wybauw in *Le Scalpel*, Nov. 26, 1922.

The writer has worked for a year on the lines laid down by Howard Jones and finds his method the best form of spinal anæsthesia. In assessing the requisite dose, however, he has abandoned Jones's process of measuring the length of the spinal column and relies on the

evidence given by the effect of his preliminary injection. This consists of sedol, a mixture of scopolamine and morphia, of which he gives 1-5 mgr. and 6 mgr. respectively. Five minutes before operation he injects ephedrin. One hour after the sedative injection the patient is classified as "spine-sensitive" or "insensitive," according as he is drowsy or not, and the percain dose is made to vary two or three c.c. in conformity with this. The spinal injection is given slowly. Jones's face-down attitude after injection is employed, but the writer has also used a lateral position with the side to be operated on uppermost. Inravenous adrenalin is freely used when there is any likelihood of falling blood pressure.

Closed endobronchial anæsthesia in thoracic surgery. T. W. GALE and R. M. WATERS in *"Anæsthesia and Analgesia,"* Nov.-Dec, 1932.

The writers furnish a preliminary report, based on experimental investigations and a few cases of an ingenious method of confining the anæsthetic delivery to the lung and completely shutting off the air tract above. In fact with dogs they have found it possible to administer anæsthetics effectually while the upper air passages were filled with fluid. The technique is described in detail. The essential feature of it is the passage of an inflatable cuff on the catheter. When this cuff is inflated to a balloon all the air passages above it is completely shut off, and when the catheter is joined up with the anæsthetic administrating apparatus " the respiratory space consists of one lung, bronchial airway, soda lime canister and spirometer. This system is filled with anæsthetic mixture from the apparatus. A constant flow of oxygen is set to replace that used by the patient in metabolism." A manometer connected to the closed system gives information of the intra-pulmonary pressure at any time. At the end of operation and before closing the chest the balloon is deflated, the airway withdrawn into the trachea and the balloon inflated again.